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Climate Change Adaptation in Flood Risk Management through Utilizing Data Sets Produced by Supercomputer System

ISHIWATARI, Mikio

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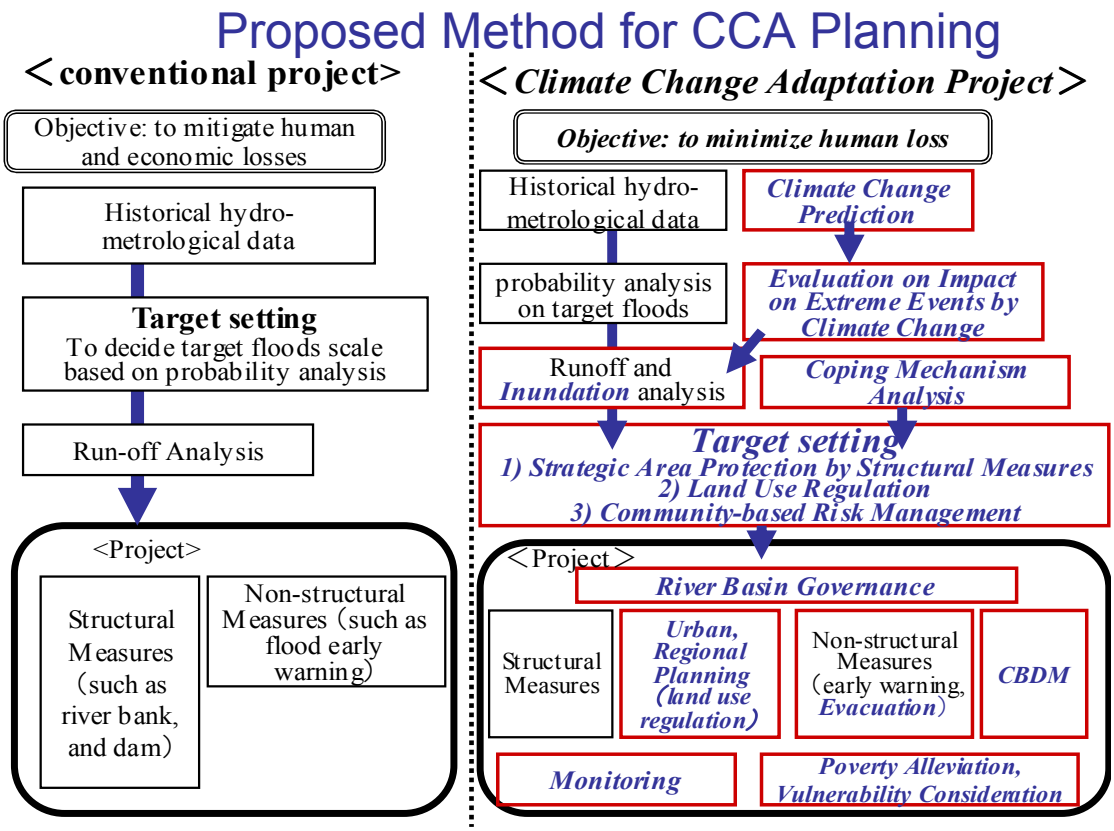
SUMMARY

Greater precipitation intensity and variability will likely increase flood risks in many areas in developing countries because of climate change. The developing countries are especially vulnerable to these effects of climate change because of their existing exposure to an already fragile environment and their economic and social sensitivity to climate change. New planning methods in flood risk management are required to be developed under recognition that climate continues to change, and that this change is predicted with uncertainty. The conventional systems of the planning methods, in particular infrastructure planning, can not be directly applied under an uncertain and changing climate. Stationarity is dead and should no longer serve as a central default assumption in flood risk assessment and planning. These risk assessment and planning methods assume that natural systems fluctuate with in an unchanging envelope of variability.

Japan International Cooperation Agency (JICA) has been promoting adaptation measures to climate change, based on the concept of "human security" as a critical basic policy for development assistance. JICA produced *Handbook on Climate Change Adaptation in the Water Sector* in 2010, which guides JICA staff and specialists to formulate and implement projects (Figure). Quantitative data on future extreme events is required as basic information to plan effective adaptation measures on climate change in flood risk management. The data sets of general circulation models that were sources for the fourth assessment report of Intergovernmental Panel on Climate Change can be utilized for prediction on precipitation. The datasets of the super-high-resolution (20-km mesh) atmospheric General Circulation Model, which the Japanese Meteorological Research Institute and Japan Meteorological Agency developed by utilizing the Earth Simulator, are also available. The range of the prediction uncertainty can be evaluated by an ensemble method through comparing the outputs of these various models at the current technology level. The range will decrease according to developing prediction technology, while the actual figure will be difficult to determine.

This paper reviews case studies of JICA projects of climate change adaptation in flood risk management. It was found that the ensemble method for predicting precipitation can be applied for planning these projects. The paper further proposes planning methods for climate change adaptation in flood risk management through utilizing data sets produced by supercomputer systems.


Proposed Method for CCA Planning
＜conventional project＞
Objective: to mitigate human and economic losses
Historical hydro-metrological data
Target setting
To decide target floods scale based on probability analysis
Run-off Analysis
<Project>
Structural Measures (such as river bank, and dam)
Non-structural Measures (such as flood early warning)
＜Climate Change Adaptation Project＞
Objective: to minimize human loss
Historical hydro-metrological data
Climate Change Prediction
probability analysis on target floods
Evaluation on Impact on Extreme Events by Climate Change
Runoff and Inundation analysis
Coping Mechanism Analysis
Target setting
1) Strategic Area Protection by Structural Measures
2) Land Use Regulation
3) Community-based Risk Management
＜Project＞
River Basin Governance
Structural Measures
Urban, Regional Planning (land use regulation)
Non-structural Measures (early warning, Evacuation)
CBDM
Monitoring
Poverty Alleviation, Vulnerability Consideration